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A NEW GENUS OF THE CHEIRURIDAE, WITH DESCRIPTIONS OF SOME NEW SPECIES.

BY DONALD C. BARTON.

WITH ONE PLATE.

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No. 21.— *A new Genus of the Cheiruridae, with Descriptions of some new Species.*

BY DONALD C. BARTON.

The genus *Cheirurus* Beyrich, has been divided into numerous subgenera or genera. Schmidt<sup>1</sup> restricts *Cheirurus* in a subgeneric sense to those cheirurids having eleven thoracic segments, the inner part of the pleuron divided by a diagonal furrow, and the glabella expanding slightly forward. Reed<sup>2</sup> follows Schmidt, but goes further and distinguishes *Crotalocephalus* Salter. *Cheirurus insignis* Beyrich, not *Cheirurus exsul* Beyrich, as Reed gives it,<sup>3</sup> is however, the genotype of *Cheirurus*. In a previous paper the necessity has been shown for distinguishing between *Cheirurus* and *Ceraurus*. In the present paper it is proposed to separate a new genus from *Cheirurus*.

*Cheirurus* as represented by *Ch. insignis* Beyrich, has nearly straight posterior glabellar furrows that open on the neck-furrow at or near the central axis of the glabella. The basal lobes are triangular and are not separated by a portion of the glabella. The glabella is smooth and expands forward.

The posterior glabellar furrows of *Ceraurus* are less than one third the width of the glabella in length and do not open directly into the neck-furrow, but are connected with it by a longitudinal constriction. The basal lobes are small and are separated by a portion of the glabella that, in width, is at least one third of the total width of the glabella at that point. The glabella and cheeks are pustulose and the glabella expands forward.

There is a group of species including *Cheirurus icarus* Billings, *Cheirurus pompilius* Billings, *Cheirurus ingricus* Schmidt, *Cheirurus ornatus* Dalman, and others, which have always been included in *Cheirurus* in the restricted sense of Schmidt and Reed, but which show certain constant differences. The posterior glabellar furrows are straight, are about one third the width of the glabella in length, and do not open into the neck-furrow. Their inner ends are connected

<sup>1</sup> Revision der Ostbaltischen Silurischen trilobiten. Mem. Acad. imp. sci. St. Petersburg, 1881, ser. 7, 30, no. 1, p. 122.

<sup>2</sup> Evolution of *Cheirurus*. Geol. mag., 1896, dec. 4, 3, p. 117, *et seq.*

<sup>3</sup> Loc. cit., p. 117.

with the neck-furrow by a curving constriction that is roughly parallel to the axis of the glabella. The basal lobes are ovate and are separated by a portion of the glabella which, in width, is less than one third the width of the glabella at that point. The glabella is smooth, and the cheeks are pitted. The sides of the glabella are usually parallel, but may diverge slightly toward the front. The differences from *Cheirurus* and from *Ceraurus* seem to be fairly constant, and this group seems, therefore, to be worthy of generic rank.

DESCRIPTION.—*Ceraurinus* is in general appearance and size much like *Cheirurus* (genotype *C. insignis* Beyrich). The glabella is subrectangular or expands only slightly. The posterior of the three pairs of glabellar furrows are straight, about one third the width of the glabella in length and slope gently backward. Their inner ends are connected with the neck-furrows by curving constrictions which are about parallel to the axis of the glabella. The constrictions are strong in some species and very faint in others. The middle part of the axial portion of the neck-furrow is parallel to the posterior edge of the neck-segment. The outer thirds each slope gently backward. The eyes are large for a cheirurid and are somewhat *Asaphus*-like.

The thorax is presumably of eleven segments. The axial lobe is slightly less than one third of the width of the thorax and tapers gently backward. Each pleuron is divided by a node-like constriction into a large inner third and a small outer two thirds. The inner third bears a deeply impressed diagonal pleural furrow.

The pygidium, well known only in *Ceraurinus icarus* (Billings), is composed of three (four), segments ending in six free spines, which are of about equal length.

The type is *Ceraurinus marginatus*, sp. nov.

REMARKS.—The American species of this genus are *Ceraurinus marginatus*, sp. nov., *Cheirurus icarus* Billings, *Ceraurinus trentonensis*, sp. nov., *Cyrtometopus scofieldi* Clarke, *Cheirurus polydorus* Billings, and *Cheirurus pompilius* Billings. In the U. S. National Museum there is a specimen from the Echinospaerites limestone (C) of Russia, which might almost be mistaken for *Ceraurinus trentonensis*, and which also corresponds very closely to the descriptions of *Cheirurus ingricus* Schmidt, and of *Cheirurus ornatus* Dalman. These latter species seem to belong to this genus. From Barrande's figures, *Cheirurus comes* Barrande, would seem possibly also to belong to *Ceraurinus*. The genus may also be represented in India. Reed<sup>1</sup> places the

<sup>1</sup> Ordovician and Silurian fossils from the Central Himalayas. *Palaeontol. Indica*, 1912, ser. 15, 7, Mem. 2, p. 10.

affinities of *Cheirurus mitis* Salter, with *Ch. ornatus* Dalman, *C. exsul* Beyrich, and *C. macrophthalmus* Kutorga, but especially with the first. He also says that it may be compared with *Cheirurus polydorus* Billings. Of the specimens figured by Reed the greater number would seem to me to be of the type of the Russian *Ceraurus* rather than of *Ceraurinus*. Figures 18 and 20, plate 15, however, resemble very closely *C. ornatus* Dalman, and *C. polydorus* Billings.

Of the actual homogeneity of this genus I have some doubts. *Ceraurinus marginatus*, *C. icarus*, *C. scofieldi*, and possibly *C. pompilius*, would seem to form one group. *Ceraurinus trentonensis* and *C. polydorus* each present a slightly different aspect. The Russian form that I have seen resembles *Ceraurinus trentonensis* rather than the others. The Bohemian form differs slightly in aspect from all the others.

*Key to Species of Ceraurinus.*

- A. Glabella expanding slightly forward.
- a. Anterior two pairs of glabellar furrows straight or nearly straight  
*ornatus* Dalman
  - b. Anterior two pairs of glabellar furrows curving  
*trentonensis*, sp. nov.
- B. Glabella with parallel or faintly convex sides
- a. Glabellar furrows curving
    - I. Glabella and cheeks moderately convex
      - Surface of the glabella smooth.....*polydorus* Billings
      - Surface of the glabella shagreened.....*ingricus* Schmidt
    - Glabella and cheeks not very convex
      - Glabella strikingly rectangular (although with rounded corners).....*comes* Barrande
  - b. Glabellar furrows straight or nearly straight
    - II. Basal lobes not separated from the body of the glabella or only faintly separated
      - The three pairs of glabellar furrows perpendicular to the dorsal furrows and nearly parallel to each other.  
*marginatus*, sp. nov.
      - Posterior pair of glabellar furrows inclined slightly backward and faintly curving at the inner ends. *ornatus* Dalman
      - Posterior pair of glabellar furrows straight and inclined strongly backward.....*scofieldi* Clarke
      - Posterior pair of glabellar furrows not reaching the dorsal furrows.....*confluens*, sp. nov.

Basal lobes completely separated from the body of the glabella.

Neck-furrow strongly convex forward. . . . *icarus* Billings

Axial portion of neck-furrow only strongly convex forward  
*pompilius* Billings

CERAURINUS MARGINATUS, sp. nov.

Plate, fig. 1.

This species is known from a single specimen, which, with the exception of the posterior segments of the thorax and the pygidium, is nearly perfect.

The cephalon is semicircular, of moderate convexity, and bounded by a broad marginal border, which is one of the most distinguishing features of this species. The glabella is subrectangular, rounded in front, and is slightly convex. The glabellar furrows are sharply and deeply incised and are about one third the width of the glabella in length. They are almost at right angles to the parallel sides of the glabella, but slope very slightly backward. The posterior three glabellar lobes are about of a size. The frontal lobe is slightly larger. The constriction connecting the inner ends of the posterior pair of glabellar furrows with the neck-furrow is extremely faint. The glabella is smooth. The cheeks are large, triangular, slightly convex, and faintly pitted. The eye is in the middle of the cheek, opposite the second glabellar furrow, and is moderately large and *Asaphus*-like. The faceted surface slopes outward instead of being vertical as in most of the *Cheiruridae*. The palpebral lobe is large and triangular with a linear depression on its upper surface. A strong eye-line runs from the base of the palpebral lobe to the base of the first pair of glabellar furrows. The facial suture, running forward from the tip of the palpebral lobe, bends inward and cuts the anterior margin in front of the glabella. From the tip of the palpebral lobe, the posterior portion of the facial suture at first curves backward and then curves outward, convex to the anterior, till just across the lateral furrow. It then slants diagonally across the border and cuts the margin just in front of the genal angle.

Thorax probably of eleven segments. The type is imperfectly preserved after the tenth thoracic segment. The axial lobe is convex, about one fourth the width of the thorax in width and tapers gently

backward. Each pleuron is divided by a node-like constriction into an inner third and an outer two thirds. The inner third is subrectangular and cut by a diagonal furrow. The outer two thirds is long, tapering, and somewhat lanceolate.

MEASUREMENTS. —

Length of cephalon.....	27 mm.
Width of cephalon at neck-ring.....	55 ±
Length of glabella.....	20
Width of glabella at frontal lobe.....	16.5
Width of glabella at basal lobe.....	17.0
Position of the eyes	
Ratio of dist. eye <sup>1</sup> to the posterior margin to the length of the cephalon....	0.44
Ratio of dist. eye to glabella to the length of the cephalon.....	0.26

This species is apparently allied to *Ch. icarus* Billings, but is distinguished from that species by the unisolated basal lobes of the glabella, by the broader margin of the cephalon, and by the more slender and tapering pleura.

FORMATION AND LOCALITY.—The Richmond of the Province of Ontario. The type (M. C. Z. No. 12 Walcott collection) is probably from Manitoulin Island, Lake Huron.

#### CERAURINUS ICARUS (Billings).

Plate, fig. 7.

*Cheirurus icarus* Billings, Can. nat. & geol., 1860, 5, p. 67, fig. 2.

*Ceraurus icarus* Meek, Ohio pal., 1873, 1, p. 162, pl. 14, fig. 2a, b, c.

*Ceraurus meekanus* Miller, N. Amer. geol. & pal., 1889, p. 537.

The name *Ceraurus meekanus* was proposed by Miller for the forms figured by Meek from Richmond, Indiana, as *C. icarus* Billings. This form must, however, be referred to *Ch. icarus* Billings.

Miller, in his definition of *C. meekanus*, says, "distinguished [from *Ch. icarus* Billings] by the form of the glabella, by the furrows, structure of the thorax, and form of the central lobe, and by the pygidium, besides occurring in higher rocks and growing to a much larger size."

Billings's figure of *Ch. icarus* is poor, and his type is lost, but his description is most minute. The pertinent points of it are:— glabella

<sup>1</sup> From tip of palpebral lobe.

oblong, sides parallel, obtusely rounded in front, neck-segment elevated at the posterior margin; neck-furrow in its middle-third parallel with the posterior margin; at each end for one third the length sloping backward; the posterior lobe of the glabella transversely oval, completely isolated; the median furrows lying nearly in a line across the glabella at midlength, nearly straight, and each in length about one third the width of the glabella; the anterior pair at a little more than one fourth the length from the front, curved slightly backward and inward. Thorax nearly twice the length of the glabella; the axis less than one third the whole width, gently tapering backward; the pleural groove short, in length about one half the width of the axis, crossing the pleura obliquely outward and downward at an angle of about 45°; pygidium about half the length of the glabella, composed of three articulations, the backward curving extremities of which form six short obtuse points.

A comparison of figure 7, a reproduction of the type of *C. meekanus*, with this description of *Ch. icarus* Billings, will serve to show the identity of the Richmond form with Billings's species. This description, both in the abridged form just given and in its entirety, are in perfect accord with *C. meekanus* Miller, and might well have been written of it. As only a few specimens are known of either form, the supposed difference in size, cited by Miller, would not seem to be sufficient to constitute a specific distinction. The supposed difference in horizon which Miller cites is now known not to exist. For these reasons it seems best to consider *C. meekanus* Miller as a synonym of *Ch. icarus* Billings.

*Ch. icarus* Billings is not placed under *Ceraurus* on account of the smoothness of the glabella and of the subequality of the pygidial spines. It is not placed under *Cheirurus* on account of the course of the posterior pair of glabellar furrows, and is, therefore, referred to *Ceraurinus*.

#### CERAURINUS TRENTONENSIS, sp. nov.

Plate, fig. 5-6.

Glabella of medium size, two thirds as wide as long, expanding slightly forward, the three posterior glabellar lobes of about equal size, the frontal lobe larger and forming about one third of the glabella. The two anterior pairs of glabellar furrows are sharply incised, but are not broad; they curve inward and gently backward till about



three eighths of the distance across the glabella. The posterior pair of glabellar furrows are straight, deep, and moderately broad, they slope gently backward, and are about one third the width of the glabella in length. At their inner ends a curving constriction connects them with the neck-furrow. The neck-furrow is well marked, in its middle-third of the axial portion parallel to the posterior margin of the neck-segment, in the two outer thirds sloping backward. The glabella is smooth. The fixed cheeks are of medium size and are faintly pitted. The genal angles are produced into short spines. The palpebral lobe is situated opposite the second and third glabellar furrows. It is triangular, with a thickened edge, and with a deep rounded furrow on the upper surface of the lobe. From the palpebral lobe a faint eye-line runs to the base of the anterior pair of glabellar furrows.

The hypostoma is, in general form, similar to that of *Cheirurus insignis* Beyrich, but at its posterior end, is slightly more rounded, and its lateral depressions do not run quite so far back before bending in. It is distinguished from the hypostoma of *Ceraurus* by the fact that in the latter, the lateral depressions do not turn in, by a much more rounded posterior point than the latter, and the more rounded termination to the border.

*Ceraurinus trentonensis* differs slightly from other members of the genus. The forward expansion of the glabella distinguishes it from all the other species except *Cheirurus ornatus* Dalman, but in this latter species the expansion of the glabella is very slight. The two pairs of curving anterior glabellar furrows are also not characteristic of most of the species of this genus. The smoothness of the glabella and the large size of the glabellar lobes are, however, incompatible with the reference of this species to *Ceraurus*, and the course of the pair of posterior glabellar furrows excludes it from *Cheirurus*. As its characteristics are most nearly those of *Ceraurinus*, it is referred to that genus. The affinities of *Ceraurinus trentonensis* are most closely with a Russian species, an unidentified specimen of which is in the U. S. National Museum. From Schmidt's description of *Cheirurus ingricus* Schmidt<sup>1</sup> and of *Cheirurus ornatus* Dalman,<sup>2</sup> this specimen would seem to be closely allied to these species, but not to be identified with either. The affinities of *Ceraurinus trentonensis* may therefore also lie with these two Russian species.

FORMATION AND LOCALITY.—Curdsville bed, at the base of the Trenton, Goat Island, Manitoulin Islands, Lake Huron. The figured

<sup>1</sup> Mem. Acad. imp. sci. St. Petersburg, 1881, ser. 7, 30, no. 1, p. 135, pl. 6, fig. 1-2.

<sup>2</sup> Schmidt, *Loc. cit.*, p. 133, pl. 6, fig. 3-4, pl. 16, fig. 1.

specimens are the property of the Geological Survey of Canada, and were collected by Dr. August F. Foerste.

An allied form is found at the same horizon at Kirkfield, Ontario. The two pairs of anterior glabellar furrows in this form are fainter, and the basal lobes of the glabella are more sharply isolated than in the specimens from Goat Island.

#### CERAURINUS SCOFIELDI (Clarke).

Plate, fig. 4.

*Cyrtometopus scofieldi* Clarke, Pal. Minn., 1897, 3, pt. 2, p. 735.

The type of *Cyrtometopus scofieldi* Clarke shows only the cranium. The specimen figured (Plate, fig. 4), presents, in addition, a free cheek, two thoracic segments, and a fragmentary pygidium. The free cheek is relatively large, is roughly triangular, and is only slightly convex. It has a relatively broad border, separated from the main portion of the cheek by a narrow lateral furrow. The axial portion of the thorax is, in width, slightly less than one third the total width. The pleura are divided into an inner and an outer portion by a faint constriction. The inner portion is cut by a diagonal furrow.

The diagonal pleural furrows, the parallel sides of the glabella, and the form and course of the pair of posterior glabellar furrows prevent the identification of this species as *Cyrtometopus*. These features, the furrow on the upper surface of the palpebral lobe, and the course of the neck-furrow, are the characteristics of *Ceraurinus*.

The specimen is apparently enrolled and the spines of the pygidium seem to project from beneath the front of the cephalon. There is one pair of relatively large spines enclosing a small notched plate. The pygidium is smaller than in the other species of the genus.

*Ceraurinus scofieldi* is apparently most closely allied to *Ceraurinus marginatus*, *C. icarus*, and *C. pompilius*. These four species are all characterized by the flatly cylindrical glabella with rounded front, and by posterior glabellar furrows of about the same pattern. The first three also agree in having the middle pair of glabellar furrows about at right angles to the axis of the glabella, and the anterior pair at a very slight angle, eyes similarly placed, palpebral lobes with a furrow on the upper surface, and a broad cephalic border. *Ceraurinus scofieldi* may be distinguished from *Ceraurinus marginatus* most readily by the greater inclination backward of the posterior pair of glabellar furrows of the former, the position of the eyes further back, and by a narrower

cephalic border. From *Ceraurinus icarus* (Billings) it may be distinguished by the more complete separation of the basal lobes of the former, and from *Cheirurus pompilius* Billings by the more rectangular form of the basal lobes of the latter.

FORMATION AND LOCALITY.—Lower Trenton at Minneapolis, Minn., the Glades, Lebanon, Tenn.; Black River at Newport, N. Y. The specimen figured (M. C. Z. No. 13), is from the latter locality, and was collected by Dr. C. D. Walcott.

CERAURINUS CONFLUENS, sp. nov.

Plate, fig. 3.

This trilobite is known only from two fragmentary specimens of the cephalon. The general outline of the cephalon is semicircular. The glabella is, in width, about one third of the extreme width of the cephalon, is strikingly rectangular, but with rounded corners, a slightly rounded and a slightly concave posterior, and is moderately convex. The glabellar furrows are linear with sharply rounded edges, are about one third of the width of the glabella in length, and slope gently backward. The two anterior pairs of glabellar furrows open cleanly into dorsal furrows. The posterior pair, however, fail to cross the outer edge of the glabella, and at each end are separated from the dorsal furrow by about one sixteenth of the glabella. The eye is situated in the middle of the cheek and about opposite the second glabellar furrow. The posterior portion of the facial suture, running outward from the posterior of the eye, curves slightly forward and apparently cuts the margin about on a level with the eye. The anterior portion of the suture runs forward from the eye bending slightly inward. The glabella is smooth. The cheeks are perhaps faintly pitted. The neck-furrow is narrow and moderately deep. Its course is similar to those of the other members of the genus.

MEASUREMENTS.—

Length of cephalon.....	23 mm.
Half-width of cephalon.....	20 mm.
Width of glabella.....	13 mm.
Position of eye	
Ratio distance eye to posterior margin to length of cephalon.....	0.43
Ratio distance eye to glabella to length of cephalon.....	0.21

REMARKS.—*Ceraurinus confluens* may be distinguished from all other species of the genus and of the other genera of the Cheiruridae by the fact that the posterior pair of glabellar furrows do not open into the dorsal furrows, but are separated from them by a narrow portion of the glabella.

FORMATION AND LOCALITY.—*Ceraurinus confluens* is known only from the Picton (Upper Trenton). The type is from Pefferlaw, Ontario, and was collected by Mr. W. A. Johnston. It is now in the collections of the Victoria Memorial Museum of the Geological Survey of Canada. A second specimen was collected by Mr. E. J. Whittaker at the same horizon at Collingwood, Ontario.